

## Watch with digital display

### Reference data

This application claims priority from Swiss patent application N. 2002CH-1962 filed on November 22, 2002.

### 5 Field of the invention

The present invention concerns a watch with digital display having a user interface allowing easy handling.

### Description of related art

10 Most of the wristwatches of modern design offer a high number of specialized or auxiliary functions, such as display of a second time zone, alarm, chronograph, countdown and many others. In particular, electronic watches comprising a digital or alphanumeric display allow a near infinite variety of indications to be established and presented.

15 The auxiliary functions are generally accessible to the user by actuating one, two or several push buttons placed on the case body or integrated into the watch's winding crown and which enable to activate the different operating modes corresponding to the normal display and to the special functions.

20 It is also known to use, in particular in watches with an analog display, the rotation of the winding button to effect the selection of the special functions, additionally to the usual functions of time setting. The winding button usually exhibits various pulled positions allowing the hour and date to be adjusted and for acting on the special functions.

25 Use of the special functions is however difficult, because of the small size and limited number of the input devices that can reasonably be integrated in a wristwatch.

Taking into account the fact that most of the special functions also require the preliminary definition of parameters, for example of the waking time, of a second time zone or other, it is obvious that use of the watch often involves long sequences of actions on the push buttons and on the winding button, which are difficult to execute and remember.

The aforementioned limitation can be attenuated somewhat by multiplying the input devices, for example by providing the watch with several push buttons affected to special functions. There exist watches with four, five or even more push buttons and also watches comprising a miniaturized digital keyboard.

If this latter solution allows the command sequences to be simplified, it remains tedious for the user who must learn and remember the functions of each push button. Furthermore, the limited space available results in the size of the input devices being extremely reduced, which makes the handling even more difficult. Finally, this solution means a higher production cost because of the greater number of required elements and is not aesthetically pleasing to everyone.

#### Brief summary of the invention

It is thus an aim of the present invention to propose a watch that can be used easily and intuitively, without having the limitations of the prior art.

It is another aim of the present invention to propose a watch having a user interface that is simple and easy to learn and remember.

It is another aim of the present invention to propose a watch having a reduced number of input devices.

These aims stated here above are achieved by a device having the characteristics of the independent claim 1 and by a method having the characteristics of the independent claim 12, preferred embodiments of the

system comprising the characteristics of the dependent claims. In particular, the invention concerns a digital watch with a digital display, said display being constituted by a first line of alphanumeric characters and by a second line of alphanumeric characters, said watch further comprising control  
5 means for keeping and displaying the current time on said digital display and a roller sensitive to axial pressure and to the rotation around its axis.

### Brief Description of the Drawings

The present invention will be better understood with the aid of the figures and of the examples illustrating by way of explaining but non-  
10 limiting example an embodiment of the distributor according to the invention.

Fig. 1 shows diagrammatically the operating principle of a watch according to the invention;

Fig. 2a to 2e show the state of the display of a watch according  
15 to the invention in its normal operating mode and in the modes "second time zone", "alarm", "chronograph" and "countdown" respectively;

Fig. 2f shows a second display option of a watch according to the invention in the mode "second time zone";

Fig. 3 shows the steps of a subsidiary date setting and time  
20 setting mode of a watch according to the invention.

### Detailed Description of the Invention

Figure 1 describes the operation diagram of a wristwatch 1 according to the invention. The watch is provided with a movement for digital watches, comprised of a quartz oscillator 10 supplying an electric  
25 signal of constant frequency, used as time base 12 for a microprocessor 21 whose working rate is rigorously synchronous to the time base 12. A permanent memory 22 in ROM or FLASH-RAM technology stores a program

for the microprocessor 21 comprising a software for counting the pulses from the time base, computing the time and date and displaying them on an alphanumeric LCD 50, consisting of two lines 1, 52 of six alphanumeric characters each, as is more clearly visible in Figure 2a.

5           The diagram described in Figure 1 is only given as an indication and does not constitute a limitation of the invention, which also comprises equivalent devices in which all or certain of the functions are implemented by other means, for example a dedicated logic integrated circuit ASIC (Application-Specific Integrated Circuit) or a programmable logic  
10 integrated circuit FPGA (Field Programmable Gate Array) or any other equivalent.

          This example should also not be interpreted in the sense that a watch according to the invention is limited to a display constituted exclusively of the two aforementioned lines of alphanumeric characters. On  
15 the contrary, the invention also includes watches whose display can also display graphical symbols.

          The memory 22 also comprises software for effecting the time setting and date setting of the watch 1. To this effect, the watch 1 also comprises an input device in the form of a roller 70 (see Figures 1 and 2a),  
20 sensitive to axial pressure and to rotation around its axis, through which the user can effect all time and date setting operations.

          The roller 70 is connected to the microprocessor 21 through the communication bus 30 or through dedicated entry lines, so that the microprocessor can detect the rotation of the roller 70 in one direction or  
25 the other or an axial pressure on the roller 70.

          The roller 70 is placed on the front side 4 of the watch so as to leave at least one sector of its lateral surface accessible, in order that the roller 70 can be turned upwards or downwards with the finger tip. The roller 70 can preferably be turned in discrete stages that are multiples of a  
30 predetermined angle and corresponding to stable positions of the roller.

The resistance offered by the roller 70 to rotation is modulated accordingly and provides the user with a tactile response.

The position of the roller 70 is specified here by way of example only. The roller 70 could, according to circumstances and to the maker's choice, also assume different positions and orientations.

An extremity 71 of the roller 70 protrudes slightly over the side of the watchcase 1 to allow the user to exert an axial pressure. The microprocessor 21 is programmed to distinguish between a short pressure and a prolonged pressure on the roller 70, a prolonged pressure being a pressure held for a length of time greater than a predetermined interval, for example a second.

In order to avoid involuntary manipulations, the watch's software provides a separate subsidiary mode for adjusting the date and time, the steps whereof are visible in Figure 3 and in table 2. The subsidiary date and time setting mode is activated by a prolonged pressure 71 on the roller 70 when the watch is in its normal operating mode 100 and is signaled by an acoustic signal emitted by the transducer 25.

The first step for adjusting the date comprises the definition of the current year, signaled by the blinking 59 of corresponding numbers in the display 50, through the rotation 75 of the roller 70 upwards or downwards for incrementing resp. decrementing. Once the wished indication is obtained, a short pressure 72 on the roller allows to confirm the entry and to move on to the next step, which is the definition of the month.

The next steps unfold in an essentially identical manner: each element to be defined is indicated by blinking of the corresponding element on the display 5. The definition is effected by rotating the roller 70 and is then confirmed by a short pressure on the roller 70. It will be appreciated that logically equivalent operations are performed by the same

action on the roller, in a coherent fashion, so that use is intuitive and easy to remember.

The memory 22 also comprises software for implementing the auxiliary functions of second time zone, alarm, chronograph and  
5 countdown. The number and nature of the auxiliary functions are specified here by way of example only. A watch according to the invention could very well provide a lower or higher number of functions or functions that are different.

Each function is associated to an operating mode of the watch, in  
10 which the lower display line 52 bears indications relative to the selected auxiliary function. The upper display line 51, on the other hand, always and exclusively indicates the time. Figures 2a, 2b, 2c, 2d, 2e show the state of the display 50 for the normal operating mode and for the operating modes corresponding to the auxiliary functions of second time zone (Fig. 2b),  
15 alarm (Fig. 2c), chronograph (Fig. 2d) and countdown (Fig. 2e).

It will be appreciated how each operating mode can immediately be distinguished from the others by means of information displayed on the lower display line 52.

The auxiliary functions can be activated cyclically by rotating the  
20 roller 71, as can be seen in table 1.

Most of the auxiliary functions require a preliminary definition of the parameters such as for example: alarm time; difference between local time and that of second time zone; duration of countdown. In this case, the corresponding operating modes also provide a subsidiary definition mode  
25 that is activated with a prolonged pressure on the roller 70 in a manner similar to the subsidiary date and time setting described here above. The steps of the subsidiary definition mode corresponding to the different functions are described in tables 2, 3, 4 and 5.

The function "time zone" also offers a second display option in which the positions of the time indicated for the second time zone and for the main time zone are switched, as can be seen in Figure 2f. This display option, which is activated by axial pressure on the roller 70, is used when  
5 the user is travelling in the time zone T2 different from the time zone T1. The switch is signaled by the indication "T1" in the lower line 52.

By opportunely activating the second display option, the upper line 51 of the display always indicates the current time, which is coherent with the watch's operating principle. Furthermore, the alarm function  
10 continues to work correctly according to the local hour, as is logical, with the acoustic alarm signal being triggered when the local time is equal to the predefined alarm time. The date indication is also coherent with local time and is incremented at the local midnight.

This function is specially designed for users who regularly travel  
15 between two different time zones and who can thus, at each trip, adjust their watch to local time by simply pressing on the roller 70, thus switching the positions of T1 and T2 without having to make any changes to the alarm definition.

Even if this embodiment provides only a second time zone T2, the  
20 invention is not limited to this. It is obvious that one could have several "time zone" functions to simultaneously keep the time of plurality of zones T2, T3, T4 etc. The user could thus easily select the time zone corresponding to the local time during a trip comprising several stages in different time zones. Each of these functions could also provide a second display option to  
25 display the local time on the first display line 51 and to modify the working of the alarm and of the calendar, in a manner totally similar to that described here above for T2.

The watch according to this embodiment of the invention presents as only entry device the roller 70, on which the user can act by  
30 rotation or by pressure. It will be observed how actions on the roller 70

always produce equivalent results in all the subsidiary definition modes.  
The resulting user interface is intuitive and easy to remember.

Because the roller 70 is the only entry device of the watch, it can be of relatively large size. Thanks to its size and its easily accessible  
5 position, the roller 70 is much easier to handle than traditional entry devices.

The watch's display is characterized by the two lines 51 and 52 of alphanumeric characters, the first of which being used only for displaying the current time and the second for displaying indications relative to the  
10 auxiliary functions. Thanks to this disposition, it is possible to achieve a rational and intuitive division between the current time, always available on the first line, and the functions, displayed by the second display line.



**Table 1: Operating modes:**

<b>Operating mode</b>	<b>Action on the roller 70</b>	<b>Result</b>
Standard display	Prolonged pressure	Auxiliary mode adjust date/time
	Short pressure	Indication of seconds yes / no
	Upward rotation	Switch to CD mode
	Downward rotation	Switch to T2 mode
Time zone (T2)	Prolonged pressure	Auxiliary mode define T2
	Short pressure	Switch T1 / T2
	Upward rotation	Switch to standard mode
	Downward rotation	Switch to AL mode
Alarm (AL)	Prolonged pressure	Auxiliary mode define AL
	Short pressure	Alarm on / off
	Upward rotation	Switch to T2mode
	Downward rotation	Switch to chronograph mode
Chronograph	Prolonged pressure	Reset to zero
	Short pressure	On / off
	Upward rotation	Switch to AL mode
	Downward rotation	Switch to CD mode
Countdown (CD)	Prolonged pressure	Auxiliary mode define CD
	Short pressure	On / off
	Upward rotation	Switch to chronograph mode
	Downward rotation	Switch to standard mode

**Table 2: auxiliary mode adjust date/time**

<b>Action</b>	<b>Result</b>
Watch initially in mode «standard display»	
Prolonged pressure	Year selected (blinking)
Upw./downw.rotation	Define year
Short pressure	Month selected
Upw./downw.rotation	Define month
Short pressure	Day selected
Upw./downw.rotation	Define day
Short pressure	Upper line selected
Upw./downw.rotation	Choice date format: «YMD» / «DMY» / «MDY»
Short pressure	Lower line selected
Upw./downw.rotation	Choice time format: 24H / 12H
Short pressure	Hour and minutes selected
Upw./downw.rotation	Define hour and minutes
Short pressure	Seconds selected
Short pressure	Reset to zero of seconds
Watch returns to initial mode «standard display»	

**Table 3: Auxiliary mode define T2**

<b>Action</b>	<b>Resultat</b>
Watch initially in mode «T2»	
Prolonged pressure	Time T2 (lower line) selected
Upw./downw.rotation	Define time T2
Short pressure	Confirmation
Watch returns to initial mode «T2»	

**Table 4: Auxiliary mode define AL**

<b>Action</b>	<b>Resultat</b>
<hr/>	
Watch initially in mode «AL»	
Prolonged pressure	Alarm time selected
Upw./downw.rotation	Define alarm time
Short pressure	Confirmation
<hr/>	
Watch returns to initial mode «AL»	

**Table 5: Auxiliary mode define CD**

<b>Action</b>	<b>Result</b>
<hr/>	
Watch initially in mode «CD»	
Prolonged pressure	Duration selected
Upw./downw.rotation	Define duration
Short pressure	Confirmation
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Watch returns to initial mode «CD»	